Section 1: Project Administrative Information

Science Category: Computational Tools and Services (SSF2)

Project Title: Online Merging and Gridding of Topographic and Bathymetric Data Sources

Lead USGS Cost Center: St. Petersburg Coastal and Marine Geology Center

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Description:
The goal of this work is to develop algorithms and an associated online access portal to efficiently merge and distribute topographic and bathymetric datasets for scientists working in the coastal environment.

Section 2: Project Summary

Scientists working in the coastal environment use bathymetric and topographic data to evaluate storm-induced coastal change, long-term shoreline change, and ecosystem vulnerability, and to perform habitat mapping. Moreover, process-based numerical models, increasingly used to simulate the impact of waves and currents on the coastal landscape, require gridded data surfaces that seamlessly span the land-water interface. The USGS collects copious amounts of lidar-derived topographic surveys and performs geophysical surveys of the nearshore bathymetry to help address these needs. However, because the data are collected at varying temporal and spatial resolutions, and from a variety of instrument platforms, merging and gridding of the data is a remaining hurdle limiting use and availability.

The focus of this work is addressing the immediate need of integrating USGS land and water-based data sources so they are readily accessible to coastal scientists and decision makers requiring a seamless data surface that spans the land-water interface. The two primary products will be 1) interpolation algorithms that integrate and grid the data; and 2) an online data portal that allows users to identify an area of interest to implement the interpolation algorithms and access the final gridded data. The resulting products and tools could be adapted to future data sources and projects beyond the coastal environment.

Interpolation Algorithms:
Researchers at the USGS St. Petersburg Coastal and Marine Science Center have developed a set of Matlab[1]-based interpolation algorithms routinely used in-house to merge topographic and bathymetric data onto grids used to initialize coastal models. Because the spatial resolution depends on the specific application, the routines use scale-controlled interpolation methods that provide smoothing length

[1] ©The Mathworks, Inc.

scales and allow for estimation of interpolation errors. We will refine these interpolation tools for speed and accuracy, ensure they are portable across computing platforms, and make them compatible with the online data portal.

Online Data Portal:
An online data portal will be developed where users can specify their area of interest, time range of data collection, desired grid resolution, and smoothing scales in a map-based application. The product will access available data sources and use the interpolation algorithms to provide a merged data surface. Output will include a map showing the sources and dates of data used in the merged data surface. In addition to USGS data, the interpolation will access bathymetric data provided by the NOAA Coastal Relief Model. To ensure completion within the funding timeline, the initial scope of the effort will be rectangular grid output for the Northern Gulf of Mexico, using USGS-collected lidar and bathymetric datasets.

This work will facilitate access by scientists and planners to USGS data and by streamlining the often tedious task of grid generation may lead to more rapid development of internal and external scientific products. The proposed architecture leverages existing algorithms, will be useful across many scientific disciplines, and provides a framework that can be easily extended to elevation datasets beyond coastal areas and to more complicated grid formations (e.g. curvilinear). In addition to the interpolation algorithms and online data portal, we plan to publish a USGS Open File Report documenting the new system.

Section 3: Project Budget

Budget Category	Federal Funding Requested	Matching Funds Proposed
1. SALARIES (including Benefits)		
Personnel Total:	$32,000	$32,000
Contract Personnel Total:	--	--
Total Salaries:	**$32,000**	**$32,000**
2. TRAVEL EXPENSES		
Travel Total (Per Diem, Airfare, Mileage/Shuttle) x # of Trips:	$4,000	$2,000
Other travel expenses (Registration fees):	**--**	--
Total Travel Expenses:	**$4,000**	**$2,000**
3. OTHER DIRECT COSTS:		
Equipment (inc. software/hardware)	$3,000	$3,000
Publication Costs:	$2,000	--
Office Supplies, Training, Misc.	$1,000	--
Total Other Direct Costs:	**$6,000**	**$3,000**
Total Direct Costs:	$42,000	$37,000
Indirect Costs (18.851% of gross):	$7,917	
GRAND TOTAL:	**$49,917**	**$37,000**